



**C20-A-AA-AEI-CH-CHST-BM-TT-MET-MNG-C-CM-EC-EE-CHOT-CHPC-  
CHPP-PET-AMT-AMG-WD-CAI-AIM-CCB-CCN-  
COMMON -102  
7002**

**BOARD DIPLOMA EXAMINATION, (C-20)  
JANUARY—2023  
FIRST YEAR (COMMON) EXAMINATION  
ENGINEERING MATHEMETICS-I**

Time : 3 hours ]

[ Total Marks : 80

**PART—A**

3×10=30

- Instructions :**
- (1) Answer **all** questions.
  - (2) Each question carries **three** marks.
  - (3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Find the domain and range of the function defined by  $f(x) = \frac{1}{x+2}$ .
2. Resolve  $\frac{5x+1}{(x-1)(x+2)}$  into partial fractions.
3. If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ , then find  $3B - 2A$ .
4. If  $\tan \alpha = \frac{1}{2}$  and  $\tan \beta = \frac{1}{3}$ , and  $0 < \alpha, \beta < \frac{\pi}{2}$ , then show that  $\alpha + \beta = \frac{\pi}{4}$ .
5. Prove that  $\frac{1 + \cos 2\alpha}{\sin 2\alpha} = \tan \alpha$ .
- \* 6. Find the modulus of the complex number  $(3+4i)(2-3i)$ .

/7002

1

[ Contd...

\*

7. \* Find the perpendicular distance of the point (3,2) from the straight line  $4x + 5y + 6 = 0$ .

8. Evaluate  $\lim_{x \rightarrow 5} \frac{x^4 - 625}{x - 5}$ .

9. Find the derivative of  $3 \tan x - 4(\log_e x) - 7x^2$  w.r.t.  $x$ .

10. If  $x = a \cos \theta$  and  $y = b \sin \theta$ , then find  $\frac{dy}{dx}$ .

### PART—B

8×5=40

**Instructions :** (1) Answer **all** questions.

(2) Each question carries **eight** marks.

11. (a) Find the inverse of the matrix  $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ .

( OR )

(b) Solve the following system of linear equations using Cramer's rule :

$$2x + y + 3z = 9, x + y + z = 6 \text{ and } x + y + z = 2$$

12. (a) Prove that  $\frac{\sin 1 + \sin 3 + \sin 5}{\cos 1 + \cos 3 + \cos 5} = \tan 3$ .

( OR )

(b) If  $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{\pi}{2}$ , then show that

\*  $x^2 + y^2 + z^2 + 2xyz = 1.$

13. <sup>\*</sup> (a) Solve  $2\sin^2 \theta - 4 = 5\cos \theta$ .

( OR )

(b) In any  $\triangle ABC$ , show that  $a^3 \cos(B - C) = 3abc$ .

14. (a) Find the equation of the circle with (1,2) and (-2,3) as the two ends of its diameter and also find its center and radius.

( OR )

(b) Find the vertex, focus, equations of axis, latus-rectum, directrix and length of latus-rectum of the parabola  $y^2 = -12x$ .

15. (a) Find the derivative of  $\tan^{-1} \frac{2x}{1-x^2}$  w.r.t  $\sin^{-1} \frac{2x}{1+x^2}$ .

( OR )

(b) If  $y = (2 + 3x)(x + 4) + \frac{x^2 + 1}{x^2 - 1}$ , find  $\frac{dy}{dx}$ .

### PART—C

10×1=10

- Instructions :** (1) Answer the following question.  
(2) The question carries **ten** marks.

16. A wire of length 50 cm is cut into two parts which are bent in the form of a square and a circle. Find the minimum value of sum of the areas so formed.

★ ★ ★

<sup>\*</sup>

/7002

3

AA23-PDF

<sup>\*</sup>